COOPERATING TECHNICAL COMMUNITY AGREEMENT
MAPPING ACTIVITY STATEMENT

NEW YORK STATE DEPARTEMENT OF ENVIRONMENTAL CONSERVATION
FEDERAL EMERGENCY MANAGEMENT AGENCY

1. Objective and Scope:

The objective of this Mapping Activity between the New York State Department of Environmental Conservation (NYSDEC) and the Federal Emergency Management Agency (FEMA) is to prepare updated flood hazard data and produce a Digital (countywide) Orthoimage Flood Insurance Rate Map (DOFIRM)[1] and Flood Insurance Study (FIS) products for designated watersheds and their incorporated communities in the State of New York.

This activity will include:

- Developing digital topographic and planimetric data as well as LIDAR and survey data to be used for Hydrologic and Hydraulic (H&H) analyses, as well as attributing and delineating floodplain boundaries;
- Conducting H&H analyses and preparing digital floodplain mapping;
- Developing Digital Orthophotos to be used for DOFIRM base maps;
- Development of a FIS report;
- Preparation of DOFIRM mapping database and metadata files. The DOFIRM file will incorporate Letters of Map Change provided by FEMA; and
- Coordination with impacted communities and assisting FEMA in resolution of any appeals and/or protests
- Reports shall be submitted electronically unless otherwise stated

2. Period of Performance:

The period of performance will be from 15 April 2000 through December 14, 2001, in accordance with Agreement Article II.

3. Funding:

The total cost of the CTC shall be $1,618,000. Upon execution of the CTC agreement $400,000 shall be provided to NYSDEC. The remainder of the funding, $1,218,000, will be obligated and payments to NYSDEC will be provided incrementally according to cost estimates, work plans, and milestones for each county study. Final payments will not be made until completion and acceptance by FEMA of all deliverables as stated in the agreed upon CTC mapping activity statements.

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[1] In the context of this CTC Agreement, a DOFIRM refers to a digital flood hazard modeling and map product that meets FEMA DFIRM standards and specifications.

4. Standards:

The following standards and documents are relevant to this Mapping Activity Statement.

A. Mapping Needs Assessment/Work Plan

- Assessment will be conducted and all products prepared in accordance with the procedures outlined in FEMA's *Assessment and Evaluation of Community Flood Mapping Needs.*
- The detailed work plan will include:
  - Streams/flooding sources to be studied and methodologies to be used
  - Schedule and estimated costs to complete major milestones
  - A QA/QC plan

B. Digital Topographic Data

- Survey Methodology:
  - Global Positioning System (GPS) Surveys: Follow NYSDOT Survey Methods and Standards
  - Conventional Surveys: Follow standard American Congress on Surveying and Mapping (ACSM) procedures.
  - Hydro Surveys: Follow EM 1110-2-1003, "Hydrographic Surveys," October 31, 1994.
- Planimetric features will be compatible with the base map (with respect to horizontal accuracy) to be used for DOFIRM production
- *Guidelines and Specifications for Study Contractors* (FEMA 37)
- FEMA Draft LIDAR specification of Appendix 4 of FEMA 37 as published on FEMA's web site will be used with a 30 cm Root Mean Square Error vertical accuracy for the DEM. This standard will be applied prior to merging the LIDAR data with field survey data.
- All LIDAR data voids will be field surveyed unless 1) they are not in a Special Flood Hazard Area 2) they are not required for cutting hydraulic model cross sections from the digital terrain 3) they are not required to delineate flood hazard or flood way boundaries. Field surveys will be performed according to FEMA 37.
- LIDAR data and survey data will be merged into a continuous topographic data set for use in H&H modeling and mapping
- Digital mapping submissions will comply with the requirements of Chapter 9 and Appendix 7 of FEMA 37

C. Hydrology and Hydraulics and Mapping

- Detailed hydrologic and hydraulic analyses and floodplain mapping will follow the standards set forth in FEMA 37, *Guidelines and Specifications for Study Contractors* (January 1995) and Title 44 of the Code of Federal Regulations (CFR), Part 65.
- Computer models used for hydrologic and/or hydraulic analyses will meet the requirements of 44 CFR 65.6(a)(6) and be on FEMA's Numerical Models Accepted by FEMA for NFIP Usage. Specifically, hydrologic analyses will be performed using gage frequency analysis on the main rivers and USGS regression equations on the tributaries. Proposed snow hydrologic methodologies will not be implemented until they have been peer reviewed, endorsed by a

Federal agency, and accepted by FEMA promptly for NFIP mapping purposes.

- Any levee or dike systems to be shown on the county's DOFIRM as providing protection from the 1% annual chance flood will comply with the requirements of 44 CFR 65.10. Chapter 7 of FEMA 37 provides guidelines for evaluating levee systems.
- Flood elevations and floodplain and floodway boundaries will reasonably tie in to non-revised information in accordance with 44 CFR 65.6(a)(6).
- The floodway will be established in accordance with 44 CFR 65.7, as well as any applicable state requirements.
- Digital work maps will comply with the *Digital Flood Insurance Rate Map (DFIRM) Specifications* which have been promulgated as of 1 April 2000, or as they exist in the final draft on April 1, 2000.
- Automated data processing and modeling algorithms for GIS-based modeling and mapping will be documented and provided to ensure they are consistent with the standards outlined above. If non-commercial (i.e., custom developed) software is used for the analysis then full user documentation, technical algorithm documentation, and the software will be provided to FEMA for review prior to performing the work.
- Digital data sets (such as elevation, basins, and land use data) will be documented by NYSDEC and certification provided to FEMA.
- For flooding sources/reaches not studied in detail as part of the project, floodplain boundaries may be re-delineated using updated topographic information and elevations from the effective FIS flood profiles. For such areas, the following standards apply:

  - Topographic mapping used to delineate the floodplain boundaries will be more recent and/or detailed than that used to prepare the effective FIRM for the affected county. It will be of adequate scale and topographic definition to provide reasonable accuracy and planimetric features will be compatible with the base map (with respect to horizontal accuracy) to be used by FEMA for Digital DOFIRM production.
  - Changed hydraulic conditions and/or significant discrepancies in stream distance between the profile and topographic mapping indicate the need for updated hydraulic analyses and may preclude the floodplain re-delineation option for some flooding sources. Therefore, prior to re-delineating floodplain boundaries, the effective FIS flood profiles will be evaluated to determine:
  - If the flood elevations remain valid or if hydraulic conditions have changed such that the profile no longer represents existing conditions (i.e., bridge or culvert construction) necessitating updated hydraulic analyses;
  - If the flood profile baseline reasonably fits the streamline on the topographic mapping to be used for this activity.
  - Work maps will comply with the requirements outlined in Chapter 9 of FEMA 37. The work maps should include the 1% and 0.2% annual chance floodplain boundaries; floodway limits; cross sections; and BFE and Flood Insurance Zone labels.

- For flooding sources/reaches designated as approximate Zone A on the currently effective FIRM that are not studied in detail as part of the project, the Zone A boundaries may be refined. For such areas, the following standards will apply:

  - 1% annual chance (100-year) water surface elevations for approximate Zone A floodplain

mapping will be determined using analyses consistent with the methods detailed in FEMA 265, Managing Floodplain Development in Approximate Zone A Areas (April 1995) and Chapter 6 of FEMA 37, Guidelines and Specifications for Study Contractors (January 1995).

- ➢ Computer models used for hydrologic and/or hydraulic analyses will meet the requirements of 44 CFR 65.6(a)(6) and be listed on FEMA's *Numerical Models Accepted by FEMA for NFIP Usage*
- ➢ Work maps depicting the revised Zone A boundaries will comply with the requirements outlined in Chapter 9 of FEMA 37.

- For flooding sources/reaches with identified floodplains on the effective FIRMs that are not studied or revised as part of the project, the effective flood hazard data will be digitized. This will include the 1% and 0.2% annual chance floodplain boundaries, floodway boundaries, Base Flood Elevations (BFEs), cross-sections, and zone labels.

D. Base Maps

Base Map Standards for DFIRMs (FEMA). This document provides minimum base map standards for DFIRMs. These include the following requirements for DFIRM base map data:

- cover the municipalities of the county within the watershed that is being mapped;
- be distributable by FEMA to the public;
- meet the minimum accuracy requirements outlined in the document; and
- include all required features.
- *Standards for Digital Orthophotos* (U.S. Geological Survey, National Mapping Program, December 1996).
- *Content Standards for Digital Geospatial Metadata* (Federal Geographic Data Committee, 1998).

E. DFIRM Production

- *Guidelines and Specifications for Flood Map Production Coordination Contractors* (Draft February 17, 1999).
- *Content Standards for Digital Geospatial Metadata* (Federal Geographic Data Committee, 1998).
- *Digital Flood Insurance Rate Map (DFIRM) Specifications*, as promulgated as of 1 April 2000, or as they exist in the final draft on April 1, 2000. This document will provide information about graphic specifications for hardcopy NYSDEC DOFIRM products as well as minimum standards for the NYSDEC DOFIRM database that accompanies the mapping files.

F. Community Coordination and Appeals Resolution

- NYSDEC will coordinate with the affected local community officials for the watershed counties in accordance with Part 66 of the NFIP regulations. Specifically, an initial meeting(s) with officials of the local communities, NYSDEC, and FEMA will be held prior

to initiation of the project in accordance with 44 CFR 66.5(e). Submission of pertinent local information and/or participation of the community as a contributing CTC partner in the project will be encouraged. Additional coordination meetings may be necessary. At a minimum, one meeting will be held with community officials after preparation of the preliminary countywide FIS and DOFIRM to present the results.

- NYSDEC will work with impacted communities to adopt any ordinances or ordinance changes needed to administer the new flood data in compliance with minimum NFIP requirements contained in 44 CFR 60 and any state requirements.
- In the event of a community or third party appeal or protest under the provisions of 44 CFR 67, NYSDEC will review the appeal or protest and provide FEMA with a formal written comment on the technical and scientific merits of the appeal. NYSDEC will make all information (e.g., topographic data, H&H analyses) used to make flood elevation determinations available to appellants as per 44 CFR 67.8(e). In the event that scientific or technical errors are identified in the appeal process NYSDEC will revise the H&H analysis and mapping as appropriate to resolve the appeal and correct the FIS and FIRM.

5. Products:

All deliverable products will require minimal review and processing by FEMA and will be submitted in accordance to all the specifications and guidelines outlined in this CTC agreement.

A. Work Plan

A work plan identifying:

- Streams/flooding sources to be studied using methodology as agreed upon by FEMA and NYSDEC.
- Schedule and estimated costs to complete major milestones; and
- QA/QC review plan as developed in cooperation with FEMA and using the Schoharie Creek Watershed as a template.

B. Base Maps

- Digital base map files in one of the GIS file formats specified in FEMA's *Base Map Standards for DFIRMs, as promulgated as of 1 April 2000; or as they exist in the final draft on April 1, 2000.*
- Database files for the layers included in the digital base map in one of the database formats specified in FEMA's *Digital Flood Insurance Rate Map (DFIRM) Specifications, as promulgated as of 1 April 2000, or as they exist in the final draft on April 1, 2000.*
- A completed Base Map Checklist, promulgated as of 1 April 2000, or as it exists in the final draft on April 1, 2000 provided by FEMA. This checklist will contain basic information about the base map data.
- Metadata files describing the digital base map data will be provided using FGDC specifications. These files may be consistent with the required information and follow the examples shown in FEMA's *Digital Flood Insurance Rate Map (DFIRM) Specifications.*
- Certification that the base map data meet FEMA's minimum standards and specifications.

C. **Field Surveys and Digital Topographic Data**

- DEM data on CD-ROM
- Hardcopy work maps
- Report summarizing results
- Root Mean Square Error (RMSE) calculations to support vertical accuracy
- Identification of remote sensing data voids, if any and supplemental data if needed;
- NGS data sheets for Network Control Points (NCP) used to control and verify remote sensing and ground surveys;
- Field surveys of channel and in LIDAR data voids will be inserted into the DEM
- A spreadsheet including reduced GPS field survey data to include hydraulic obstructions surveys for parameterizing bridge models in HEC-RAS.

D. **Hydrology and Hydraulics Mapping**

NYSDEC will make available items in TSDN format, as outlined in FEMA's *Guide for Preparing Technical Support Data Notebook (TSDN)*. These include:

- Digital 1% and 0.2 % annual chance floodplain and floodway boundaries;
- Digital profiles of the 10%, 2%, 1%, and 0.2% annual chance water surface elevations representing existing conditions;
- Flood Insurance Study (FIS) report, organized on a watershed basis;
- Floodway data tables;
- Digital copies of all hydrologic and hydraulic modeling (input and output files);
- NYSDEC will deliver all digital input and output data, intermediate data processing products, GIS data layers, and final products in the format of the DOFIRM database structure.

E. **DOFIRMs**

- DOFIRM mapping files in one of the GIS file formats specified in FEMA's *Digital Flood Insurance Rate Map (DFIRM) Specifications, as promulgated as of 1 April 2000 or as they exist in final draft on April 1, 2000.* These files should be provided on CD-ROM.
- DOFIRM database files in one of the database formats specified in FEMA's *Digital Flood Insurance Rate Map (DFIRM) Specifications, as promulgated as of 1 April 2000 or as they exist in final draft on April 1, 2000.* These files should also be provided on CD-ROM.
- Metadata files describing the DOFIRM data should be provided. These files will include the required information and follow the examples shown in FEMA's *Digital Flood Insurance Rate Map (DFIRM) Specifications, as promulgated as of 1 April 2000 or as they exist in final draft on April 1, 2000.*
- A Quality Assurance/Quality Control (QA/QC) report that includes a description and the results of all automated or manual quality assurance steps taken during the preparation of the DOFIRMs will be provided.

6. Schedule and Milestones:

Milestone 1 (Work Plan):

Upon completion, products for the first milestone will be provided to the FEMA Project Officer. These include:

- Documentation of the proposed source of topographic data, including: scale; GIS data format; vertical and horizontal accuracy; source/methodology; date of survey/data collection
- A written summary of the initial data research; proposed analysis methodologies; and a work plan.
- Documentation of digital data sets to be used (such as elevation, basin, and land use data). Full user documentation; technical description of methodologies and algorithms; and a copy of the source codes and custom-developed software applications for GIS-based modeling will also be provided.
- Proposed cross section locations.
- Reference to effective FIRM panels depicting limits of proposed study.

Milestone 2 (Hydrology Phase):

Upon completion, products for the second milestone will be provided to the FEMA Project Officer. This includes draft hydrologic analyses in accordance with the TSDN format.

Milestone 3 (Hydraulics Phase):

Upon completion, products for the third milestone will be provided to the FEMA Project Officer. These include the hydraulic models, digital terrain models and sample floodplain mapping in accordance with TSDN format.

Milestone 4 (Final Products):

Upon completion, final products will be provided to the FEMA Project Officer. These include:

- The completed TSDN and accompanying data containing the information outlined in Section 5 of this Mapping Activity Statement.
- A QA/QC report documenting the results of the independent review of all computational and data processing procedures.
- Mapping needs assessment and priority list of other counties; include estimated cost for each county. This will be used to generate subsequent mapping activity statements.

7. Certification:

The following certifications apply to this Mapping Activity (as appropriate):

- H&H analyses and field data will be certified by a registered professional engineer or licensed land surveyor, respectively, in accordance with 44 CFR 65.6(f).
- Topographic information will be certified by a registered professional engineer or licensed

land surveyor in accordance with 44 CFR 65.5(c).

- Any levee systems to be accredited as discussed in Section 4 of this Mapping Activity Statement will be certified in accordance with 44 CFR 65.10(e).

8. Technical Assistance and Resources:

NYSDEC will obtain copies of LOMCs, archived engineering back-up data, and data collected as part of the Five-Year Mapping Needs Assessment from FEMA's Flood Map Production Coordination Contractor (FMPCC) as part of the initial data research. Copies of FEMA's rule-based engineering software packages, such as CHECK-RAS to evaluate HEC-RAS models and RASPLOT, an automated flood profile plotting software package, may also be obtained through the FMPCC. Specific technical and programmatic support may be provided through FEMA's FMPCC; such assistance should be requested through the FEMA Project Officer specified in Section 12 of this Mapping Activity Statement.

NYSDEC may also consult with the FEMA Project Officer to request support in the areas of: recommended data sources, recommended digital data accuracy standards, assessing vertical data accuracy, data collection methods or sub-contractors, GIS-based engineering and modeling training.

FEMA will be providing the following support:

- Assist in coordination, management and review of CTC agreement and related activities
- Technical review and assistance as needed to NYSDEC for all H&H and mapping products
- Any required post preliminary processing and final production of FISs and DOFIRM panels
- Processing Letters of Map Change in New York State
- Community due process activities such as the statutory appeal period and six month compliance period
- Assist in evaluating and resolving all appeals with NYSDEC
- Printing and distribution of map panels
- FEMA will provide assistance and training in the use of CHECK-RAS and RASPLOT
- FEMA will provide assistance and standardization to categorize files and catalog files
- FEMA will work with NYSDEC to improve guidance and procedures for the quality control and vertical accuracy assessment of LIDAR data sets

9. Subcontractors:

Subcontractors using federal funds provided as part of this Mapping Activity will comply with the requirements of 44 CFR 13.36.

10. Quality Assurance/Quality Control (QA/QC) Procedures:

- The QA/QC procedures outlined in Chapter 10 of the *Guidelines and Specifications for Study Contractors* should be followed during the development of the hydrologic and hydraulic analyses and floodplain mapping. Analyses and mapping should be independently reviewed

for compliance with the standards defined in Section 4 of this Mapping Activity Statement. This independent review will be conducted by FEMA.

- NYSDEC will document internal QA/QC procedures to FEMA to ensure all calculations and data processing were reviewed. FEMA will assist with QA/QC to establish procedures.
- For GIS-based, automated modeling, QA/QC activities should ensure automated calculations are reasonable and in compliance with the standard flood modeling and mapping methods. NYSDEC will document internal QA/QC procedures to FEMA to ensure all calculations and data processing were reviewed. FEMA will use commercial off the shelf GIS-based H & H software for verification of NYSDEC automated H & H modeling and data processing.

11. Reporting:

Reporting requirements will be in accordance with Agreement Articles V & VI and specified in Detail by FEMA Region II.

12. Points of Contact:

The FEMA Project Officer is Mr. Paul Weberg and NYSDEC's Project Manager is Mr. Howard Pike. Each party has caused this Mapping Activity Statement to be executed by its duly authorized representatives.

Howard Pike — 4/6/2000

CTC Partner's authorized representative — date

Paul Weberg — 4/6/00

FEMA Project Officer, Paul Weberg — date

Cynthia Pollnow — April 6 2000

FEMA Region II, Chief, Community Mitigation Program Branch, Cynthia Pollnow — date